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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/690,401	DIAMENT, BENJAMIN JAY	
	Examiner	Art Unit	
	Cam Y T. Truong	2162	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-6,13,15-18,25,27-30 and 37-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3-6, 13, 15-18, 25, 27-30 and 37-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant has amended claims 1, 13 and 25 in the amendment filed on 7/25/2007.

Claims 1, 3-6, 13, 15-18, 25, 27-30 and 37-48 are pending in this Office Action.

Response to Arguments

2. Applicant's arguments with respect to claims 1, 3-6, 13, 15-18, 25, 27-30 and added claims 37-48 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argued that no logarithm is taken of any number in the Burrows process of creating a search query expression.

In response to applicant's argument, Burrows teaches [0314] Range-Based Metawords [0315] The number line begins with integers 1 and 2, and as shown in FIG. 19, has a portion . . . , 56, 57, . . . , 70, 71, . . . , and so forth. The integers represent values on which range-based query operations are desired, e.g., dates, and page sizes. The ranges can be selected from an interval of a predetermined size, e.g., 16, 4K, 512K, etc.

[0316] The predetermined interval can be used to generate a plurality of sets of subintervals. For example, a first set of subintervals L1-L4, as shown in FIG. 19. The first set, e.g., level L1 has one subinterval for each integer value.

[0317] The subintervals can be represented by literal metawords, e.g.,

1.sub.--1, 2.sub.--1, . . . , 56.sub.--1, 57.sub.--1, . . . , 70.sub.--1, 71.sub.--1, etc, where the first number represents the starting value, and the second number length of the interval. For clarity, the usual ".quadrature." designation of metawords is not used.

[0318] The next subset of intervals, for example, the intervals of the level L2 shows a groups of adjacent subintervals of the previous set, e.g., level L1. In one grouping, the size of the subintervals doubles for each next set, until the entire interval is covered in one subinterval, e.g., 1, 2, 4, 8 etc. The combinations of the second level L2 can be represented by the metawords 2.sub.--2, 4,.sub.--2, . . . , 56.sub.--2, 58.sub.--2, . . . , 70.sub.--2, 71.sub.--2, and so forth.

[0319] A next set, level L3, can then be encoded by metawords representing the adjacent groups of the previous level 2 as 4.sub.--4, 8.sub.--3, . . . , 56.sub.--3, 60.sub.--3, 64.sub.--3, 68.sub.--3, size "four." Additional levels can be encoded 8.sub.--4, 16.sub.--4, . . . , 56.sub.--4, 64.sub.--4, . . . , and so forth. The number of levels needed to encode a range of N integers, with doubling of sizes, is a function of log.sub.2 N, where N is the number of possible rage-based integer values to be encoded.

[0320] During parsing of the pages by the parser 30, if a word 1962 with a range attribute is recognized, encode the value of the word ("62") as follows. First, generate a [location, word] pair as one normally would for any word, for example, the pair [location, 61]. Second, generate range-based metawords pairs

for all possible subintervals which include the word. For example, using FIG. 19 as a reference, the vertical line 1920 passes through the word "62" and all combinations which include word of levels L1-L4.

[0321] Therefore, the additional metaword pairs which will be generated include [location, 62.sub.--1], [location, 62.sub.--2], [location, 60.sub.--3], and [location, 56.sub.--4], all for the same location as the word "62". Similarly, the word ("71") 1971 could be encoded as [loc, 71], [loc, 71.sub.--1], [loc, 70.sub.--2], [loc, 68.sub.--3], and [loc, 64.sub.--4], and so forth. The succeeding values for each level can be determined by bit shift and bit clear operations using the literal values. [0322] During operation, a range-based query specifies: [0323] find all pages having a size in the range 57 through 70 bytes.

[0324] The range "57-70" can be converted to a Boolean search for the range-based metawords in the desired range. That is, search the word entries corresponding the subintervals whose concatenation exactly spans the range of the search term. If the selected metawords which exactly span the range are minimized, then the search time is also minimized since a minimum number of f index stream readers need to be used.

[0325] Therefore, the metawords which are to be used for scanning the index are selected from the "bottom" level up. For example, the metawords 57.sub.--1, 58.sub.--2, 60.sub.--3, 64.sub.--3, 68.sub.--2, and 70.sub.--1 exactly span the range "57-70" as shown by the cross hashing.

[0326] With a log.sub.2 based encoding at most 2L-1 metawords need to be

searched if L levels are used for the expression of the range-based values. Julian date ranges can adequately be handled with sixteen levels of encoding, e.g., at most thirty-one metawords during a query. It should be understood that this technique could be expanded to handle fixed-point numbers as well. Other groupings of adjacent values can also be used, for example threes, fours, etc.

The above information shows that logarithm is taken in numbers in Burrows process of creating a search query expression.

Applicant argued that claims 25-30, 46-48 are statutory.

However, as regarding claims 25-30 and 46-48, "a search engine for querying number-range searches", The claims lack the necessary physical articles or objects to constitute a machine or a manufacture within the meaning of 35 USC 101. They are clearly not a series of steps or acts to be a process nor are they a combination of chemical compounds to be a composition of matter. As such, they fail to fall within a statutory category. They are, at best, functional descriptive material *per se*.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 25-30 and 46-48 are rejected under 35 U.S.C.101 because the claimed invention is directed to non-statutory subject matter, specifically, as directed to an abstract idea.

As regarding claims 25-30 and 46-48, "a search engine for querying number-range searches", The claims lack the necessary physical articles or objects to constitute a machine or a manufacture within the meaning of 35 USC 101. They are clearly not a series of steps or acts to be a process nor are they a combination of chemical compounds to be a composition of matter. As such, they fail to fall within a statutory category. They are, at best, functional descriptive material *per se*.

Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." Both types of "descriptive material" are nonstatutory when claimed as descriptive material *per se*, 33 F.3d at 1360, 31 USPQ2d at 1759. When functional descriptive material is recorded on some computer-readable medium, it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994)

Merely claiming nonfunctional descriptive material, i.e., abstract ideas, stored on a computer-readable medium, in a computer, or on an electromagnetic carrier signal,

does not make it statutory. See *Diehr*, 450 U.S. at 185-86, 209 USPQ at 8 (noting that the claims for an algorithm in *Benson* were unpatentable as abstract ideas because "[t]he sole practical application of the algorithm was in connection with the programming of a general purpose computer.").

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 3-4, 6, 13, 15, 16, 18, 25, 27-28, 30, 38, 40, 42, 44, 46, 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda (US 2003/0225779) in view of Burrows (US 20040243569).

As to claims 1 and 13, Matsuda teaches the claimed limitations:

"receiving a number-range search query having a number range, wherein the number range includes a boundary number" as processing a query have a condition of price >10. 10 is represented as one boundary number (paragraph [0047]);

"generating an expression of numerical index terms based on the boundary number" as transforming query to an equivalence search using an inverted index generated, e.g., the exemplary query is simple query having a single search condition. For two numbers N and M, their tokens Ni and Mi, if N.M there exists, by definition, a token Nj which is greater than Mj. In this case, the transformed query

has an index entry that includes attribute, token, list). The transformed query is based on number 10 (paragraph [0047, 0048, 0049], page 4, col. Right, lines 49-52),

"wherein at least one numerical index term includes information associated with an indexed number" as each index entry includes each token associated with an indexed number, e.g., token 0001 is associated with index 5 (page 4, col. Right, lines 49-52; fig. 5);

"searching a document index using the expression to identify one or more document containing indexed numbered that satisfy the expression" as returning to the search condition, document Ids are retrieved from each matching token index which results in an ID list of all documents that match those tokens (paragraph [0052]);

"returning a result in accordance with at least a subset of the identified documents" as (paragraph 0052, page 20, col. Right).

Matsuda does not explicitly teach the claimed limitation "wherein a respective numerical index term in the expression includes information indicative of an integral portion of a logarithm of the boundary number".

Burrows teaches [0314] Range-Based Metawords [0315] The number line begins with integers 1 and 2, and as shown in FIG. 19, has a portion . . . , 56, 57, . . . , 70, 71, . . . , and so forth. The integers represent values on which range-based query operations are desired, e.g., dates, and page sizes. The ranges can be selected from an interval of a predetermined size, e.g., 16, 4K, 512K, etc.

[0316] The predetermined interval can be used to generate a plurality of sets

of subintervals. For example, a first set of subintervals L1-L4, as shown in FIG. 19. The first set, e.g., level L1 has one subinterval for each integer value.

[0317] The subintervals can be represented by literal metawords, e.g., 1.sub.--1, 2.sub.--1, . . . , 56.sub.--1, 57.sub.--1, . . . , 70.sub.--1, 71.sub.--1, etc, where the first number represents the starting value, and the second number length of the interval. For clarity, the usual ".quadrature." designation of metawords is not used.

[0318] The next subset of intervals, for example, the intervals of the level L2 shows a groups of adjacent subintervals of the previous set, e.g., level L1. In one grouping, the size of the subintervals doubles for each next set, until the entire interval is covered in one subinterval, e.g., 1, 2, 4, 8 etc. The combinations of the second level L2 can be represented by the metawords 2.sub.--2, 4,.sub.--2, . . . , 56.sub.--2, 58.sub.--2, . . . , 70.sub.--2, 71.sub.--2, and so forth.

[0319] A next set, level L3, can then be encoded by metawords representing the adjacent groups of the previous level 2 as 4.sub.--4, 8.sub.--3, . . . , 56.sub.--3, 60.sub.--3, 64.sub.--3, 68.sub.--3, size "four." Additional levels can be encoded 8.sub.--4, 16.sub.--4, . . . , 56.sub.--4, 64.sub.--4, . . . , and so forth. The number of levels needed to encode a range of N integers, with doubling of sizes, is a function of log.sub.2 N, where N is the number of possible rage-based integer values to be encoded.

[0320] During parsing of the pages by the parser 30, if a word 1962 with a range attribute is recognized, encode the value of the word ("62") as follows. First, generate a [location, word] pair as one normally would for any word, for example, the pair [location, 61]. Second, generate range-based metawords pairs for all possible subintervals which include the word. For example, using FIG. 19 as a reference, the vertical line 1920 passes through the word "62" and all combinations which include word of levels L1-L4.

[0321] Therefore, the additional metaword pairs which will be generated include [location, 62.sub.--1], [location, 62.sub.--2], [location, 60.sub.--3], and [location, 56.sub.--4], all for the same location as the word "62". Similarly, the word ("71") 1971 could be encoded as [loc, 71], [loc, 71.sub.--1], [loc, 70.sub.--2], [loc, 68.sub.--3], and [loc, 64.sub.--4], and so forth. The succeeding values for each level can be determined by bit shift and bit clear operations using the literal values. [0322] During operation, a range-based query specifies: [0323] find all pages having a size in the range 57 through 70 bytes.

[0324] The range "57-70" can be converted to a Boolean search for the range-based metawords in the desired range. That is, search the word entries corresponding the subintervals whose concatenation exactly spans the range of the search term. If the selected metawords which exactly span the range are minimized, then the search time is also minimized since a minimum number of f index stream readers need to be used.

[0325] Therefore, the metawords which are to be used for scanning the index are

selected from the "bottom" level up. For example, the metawords 57.sub.--1, 58.sub.--2, 60.sub.--3, 64.sub.--3, 68.sub.--2, and 70.sub.--1 exactly span the range "57-70" as shown by the cross hashing.

[0326] With a log.sub.2 based encoding at most 2L-1 metawords need to be searched if L levels are used for the expression of the range-based values. Julian date ranges can adequately be handled with sixteen levels of encoding, e.g., at most thirty-one metawords during a query. It should be understood that this technique could be expanded to handle fixed-point numbers as well. Other groupings of adjacent values can also be used, for example threes, fours, etc.

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Burrows' s teaching to Matsuda's system in order to process a query having multiple ranges more efficiently and further eliminate processing time by eliminating unnecessary physical accesses of the data while executing of the query and further order to identify locations of the records including portions of numeric information within the span of the range of values.

As to claims 3, 15, 27, Matsuda teaches the claimed limitation "wherein at least one numerical index term in the expression includes information indicating that a specified digit is the last non-zero digit of a respective number" as (fig. 5, page 4, col. Right, lines 49-52, paragraph [0042]).

As to claims 4, 16, 28, Matsuda teaches the claimed limitation "wherein at least one numerical index term in the expression includes information indicative of the sign of a respective number" as (fig. 5, page 4, col. Right, lines 49-52, paragraph [0042]).

As to claims 6, 18 and 30, Matsuda does not explicitly teach the claimed limitation "wherein the expression includes a plurality of numerical index terms that each correspond to a single respective digit of a respective number". Burrows teaches index terms that corresponding to a digit of a range number (fig. 7, col. 26, lines 1-30).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Burrows's teaching of index terms that corresponding to a digit of a range number to Matsuda's system in order to identify locations of the records including portions of numeric information within the span of the range of values.

As to claim 25, Matsuda teaches the claimed limitations:

A query-encoder configured to receive a number-range search query having a boundary number," as processing a query have a condition of price >10. 10 is represented as one boundary number. The above information indicates that the system has included a query-encoder to receive the query and process the query (paragraph [0047]);

"wherein the query encoder is configured to generate an expression of numerical index terms based on the boundary number," as transforming query to an equivalence search using an inverted index generated, e.g., the exemplary query is simple query having a single search condition. For two numbers N and M, their tokens Ni and Mi, if N.M there exists, by definition, a token Nj which is greater than Mj. In this case, the transformed query has an index entry that includes attribute, token, list). The transformed query is based on number 10 (paragraph [0047, 0048, 0049], page 4, col. Right, lines 49-52),

"and wherein a respective numerical index term in the expression includes information" as each index entry includes each token associated with an indexed number, e.g., token 0001 is associated with index 5 (page 4, col. Right, lines 49-52; fig. 5);

"coupled to the query encoder configured to search a document index using the expression to identify one or more document containing numbers that satisfy the expression" as returning to the search condition, document Ids are retrieved from each matching token index which results in an ID list of all documents that match those tokens (paragraph [0052]).

"returning a result in accordance with at least a subset of the identified documents" as (paragraph 0052, page 20, col. Right).

Matsuda does not explicitly teach the claimed limitation "wherein a respective numerical index term in the expression includes information indicative of an integral portion of a logarithm of the boundary number".

Burrows teaches [0314] Range-Based Metawords [0315] The number line begins with integers 1 and 2, and as shown in FIG. 19, has a portion . . . , 56, 57, . . . , 70, 71, . . . , and so forth. The integers represent values on which range-based query operations are desired, e.g., dates, and page sizes. The ranges can be selected from an interval of a predetermined size, e.g., 16, 4K, 512K, etc.

[0316] The predetermined interval can be used to generate a plurality of sets of subintervals. For example, a first set of subintervals L1-L4, as shown in FIG. 19. The first set, e.g., level L1 has one subinterval for each integer value.

[0317] The subintervals can be represented by literal metawords, e.g., 1.sub.--1, 2.sub.--1, . . . , 56.sub.--1, 57.sub.--1, . . . , 70.sub.--1, 71.sub.--1, etc, where the first number represents the starting value, and the second number length of the interval. For clarity, the usual ".quadrature." designation of metawords is not used.

[0318] The next subset of intervals, for example, the intervals of the level L2 shows a groups of adjacent subintervals of the previous set, e.g., level L1. In one grouping, the size of the subintervals doubles for each next set, until the entire interval is covered in one subinterval, e.g., 1, 2, 4, 8 etc. The combinations of the second level L2 can be represented by the metawords 2.sub.--2, 4,.sub.--2, . . . , 56.sub.--2, 58.sub.--2, . . . , 70.sub.--2, 71.sub.--2, and so forth.

[0319] A next set, level L3, can then be encoded by metawords representing the

adjacent groups of the previous level 2 as 4.sub.--4, 8.sub.--3, . . . , 56.sub.--3, 60.sub.--3, 64.sub.--3, 68.sub.--3, size "four." Additional levels can be encoded 8.sub.--4, 16.sub.--4, . . . , 56.sub.--4, 64.sub.--4, . . . ; and so forth. The number of levels needed to encode a range of N integers, with doubling of sizes, is a function of log.sub.2 N, where N is the number of possible rage-based integer values to be encoded.

[0320] During parsing of the pages by the parser 30, if a word 1962 with a range attribute is recognized, encode the value of the word ("62") as follows. First, generate a [location, word] pair as one normally would for any word, for example, the pair [location, 61]. Second, generate range-based metawords pairs for all possible subintervals which include the word. For example, using FIG. 19 as a reference, the vertical line 1920 passes through the word "62" and all combinations which include word of levels L1-L4.

[0321] Therefore, the additional metaword pairs which will be generated include [location, 62.sub.--1], [location, 62.sub.--2], [location, 60.sub.--3], and [location, 56.sub.--4], all for the same location as the word "62". Similarly, the word ("71") 1971 could be encoded as [loc, 71], [loc, 71.sub.--1], [loc, 70.sub.--2], [loc, 68.sub.--3], and [loc, 64.sub.--4], and so forth. The succeeding values for each level can be determined by bit shift and bit clear operations using the literal values. [0322] During operation, a range-based query specifies: [0323] find all pages having a size in the range 57 through 70 bytes.

[0324] The range "57-70" can be converted to a Boolean search for the

range-based metawords in the desired range. That is, search the word entries corresponding the subintervals whose concatenation exactly spans the range of the search term. If the selected metawords which exactly span the range are minimized, then the search time is also minimized since a minimum number of f index stream readers need to be used.

[0325] Therefore, the metawords which are to be used for scanning the index are selected from the "bottom" level up. For example, the metawords 57.sub.--1, 58.sub.--2, 60.sub.--3, 64.sub.--3, 68.sub.--2, and 70.sub.--1 exactly span the range "57-70" as shown by the cross hashing.

[0326] With a log.sub.2 based encoding at most 2L-1 metawords need to be searched if L levels are used for the expression of the range-based values. Julian date ranges can adequately be handled with sixteen levels of encoding, e.g., at most thirty-one metawords during a query. It should be understood that this technique could be expanded to handle fixed-point numbers as well. Other groupings of adjacent values can also be used, for example threes, fours, etc.

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Burrows' s teaching to Matsuda's system in order to process a query having multiple ranges more efficiently and further eliminate processing time by eliminating unnecessary physical accesses of the data while executing of the query and further order to identify locations of the records including portions of numeric information within the span of the range of values.

of values.

As to claims 38, 42 and 46, Matsuda does not explicitly teach the claimed limitation “wherein the respective numerical index term in the expression corresponds to the position of the respective digit within the respective number”.

Burrows teaches index terms that corresponding to the position of a digit of a range number (fig. 7, col. 26, lines 1-30).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Burrows's teaching of index terms that corresponding to the position of a digit of a range number to Matsuda's system in order to identify locations of the records including portions of numeric information within the span of the range of values.

As to claims 40, 44 and 48, Matsuda does not explicitly teach the claimed limitation “ wherein a respective numerical index term in the expression includes information indicative of a mantissa of a respective number”.

Burrows teaches index terms that corresponding to the position of a digit of a range number (fig. 3, 7, col. 26, lines 1-30).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Burrows's teaching of index terms that corresponding to the position of a digit of a range number to Matsuda's system in

order to identify locations of the records including portions of numeric information within the span of the range of values.

7. Claims 5, 17 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda (US 2003/0225779) in view of Burrows (US 20040243569) and further in view of Lewak et al (or hereinafter "Lewak") (US 6826566).

As to claims 5, 17 and 29, Matsuda does not explicitly teach the claimed limitation "wherein at least one numerical index term includes information indicative of a number type associated with a respective number range".

Lewak teaches value types includes numbers and dates (col. 12, lines 8-10).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Lewak's teaching of value types includes numbers and dates to Matsuda's system in order to allow a user to select a specific number type for searching so that the speed of query responses quickly.

8. Claims 37, 41, 45, 39, 43 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda (US 2003/0225779) in view of Burrows (US 20040243569) and further in view of Beavin et al (or hereinafter "Beavin") (US 6571233).

As to claims 37, 41 and 45, Matsuda does not explicitly teach the claimed limitation "wherein a respective numerical index term in the expression represents a

respective digit of a respective number in base 10". Beavin teaches decimal number 270 refers to numbers in base 10 (col. 4, lines 62-65)

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Beavin's teaching of decimal number 270 refers to numbers in base 10 to Matsuda's system in order to improve a query optimization that is able to process query predicates with different data types for searching/.retrieving records in a large database.

As to claims 39, 43 and 47, Matsuda does not explicitly teach the claimed limitation "wherein the integral portion of the logarithm of a respective boundary number is an integral portion of a base 10 logarithm of the respective boundary number".

Burrows teaches index server (col. 3, lines 40-65; col. 4, lines 55-65).

the range "57-70" can be converted to a Boolean search for the range-based metawords in the desired range. That is, search the word entries corresponding the subintervals whose concatenation exactly spans the range of the search term. If the selected metawords which exactly span the range are minimized, then the search time is also minimized since a minimum number of f index stream readers need to be used. The metawords which are to be used for scanning the index are selected from the "bottom" level up. For example, the metawords 57.sub.-- 1, 58.sub.-- 2, 60.sub.-- 3, 64.sub.-- 3, 68.sub.-- 2, and 70.sub.-- 1 exactly span the range "57-70" as shown by the cross hashing (col. 26, lines 1-25).

Beavin teaches decimal number 270 refers to numbers in base 10 (col. 4, lines 62-65)

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Burrows's teaching of index server and the range "57-70" can be converted to a Boolean search for the range-based metawords in the desired range. That is, search the word entries corresponding the subintervals whose concatenation exactly spans the range of the search term. If the selected metawords which exactly span the range are minimized, then the search time is also minimized since a minimum number of index stream readers need to be used. The metawords which are to be used for scanning the index are selected from the "bottom" level up. For example, the metawords 57.sub.-- 1, 58.sub.-- 2, 60.sub.-- 3, 64.sub.-- 3, 68.sub.-- 2, and 70.sub.-- 1 exactly span the range "57-70" as shown by the cross hashing to and Beavin's teaching of decimal number 270 refers to numbers in base 10 to Matsuda's system in order to improve a query optimization that is able to process query predicates with different data types for searching/.retrieving records in a large database, process a query having multiple ranges more efficiently, reduce processing time by eliminating unnecessary physical accesses of the data while executing of the query and further order to identify locations of the records including portions of numeric information within the span of the range of values.

9. Claims 37, 41, 45, 39, 43 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda (US 2003/0225779) in view of Burrows (US

20040243569) and further in view of Rajasekaran et al (or hereinafter "Rajasekaran") (US 7020782).

As to claims 37, 41 and 45, Matsuda does not explicitly teach the claimed limitation "wherein a respective numerical index term in the expression represents a respective digit of a respective number in base 10". Rajasekaran teaches representing each digit of a respective number in base 10 (col. 5, lines 35-55).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Rajasekaran teaches representing each digit of a respective number in base 10 to Matsuda's system in order to improve a query optimization that is able to process query predicates with different data types for searching/.retrieving records in a large database.

As to claims 39, 43 and 47, Matsuda does not explicitly teach the claimed limitation "wherein the integral portion of the logarithm of a respective boundary number is an integral portion of a base 10 logarithm of the respective boundary number".

Burrows teaches index server (col. 3, lines 40-65; col. 4, lines 55-65).

the range "57-70" can be converted to a Boolean search for the range-based metawords in the desired range. That is, search the word entries corresponding the subintervals whose concatenation exactly spans the range of the search term. If the selected metawords which exactly span the range are minimized, then the search time is also minimized since a minimum number of f

index stream readers need to be used. The metawords which are to be used for scanning the index are selected from the "bottom" level up. For example, the metawords 57.sub.-- 1, 58.sub.-- 2, 60.sub.-- 3, 64.sub.-- 3, 68.sub.-- 2, and 70.sub.-- 1 exactly span the range "57-70" as shown by the cross hashing (col. 26, lines 1-25).

Rajasekaran teaches representing each digit of a respective number in base 10 (col. 5, lines 35-55).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Burrows's teaching of index server and the range "57-70" can be converted to a Boolean search for the range-based metawords in the desired range. That is, search the word entries corresponding the subintervals whose concatenation exactly spans the range of the search term. If the selected metawords which exactly span the range are minimized, then the search time is also minimized since a minimum number of index stream readers need to be used. The metawords which are to be used for scanning the index are selected from the "bottom" level up. For example, the metawords 57.sub.-- 1, 58.sub.-- 2, 60.sub.-- 3, 64.sub.-- 3, 68.sub.-- 2, and 70.sub.-- 1 exactly span the range "57-70" and Rajasekaran teaches representing each digit of a respective number in base 10 to Matsuda's system in order to improve a query optimization that is able to process query predicates with different data types for searching/.retrieving records in a large database, process a query having multiple ranges more efficiently, reduce processing time by eliminating unnecessary physical accesses of the data while

executing of the query and further order to identify locations of the records including portions of numeric information within the span of the range of values.

Contact Information

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cam Y T. Truong whose telephone number is (571) 272-4042. The examiner can normally be reached on Monday to Firday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Breene can be reached on (571) 272-4107. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Art Unit 2162